

1 Claims:

1. An electrochemical cell comprising a cathode, an electrolyte in ionic contact with said cathode, and an anode in physical contact with said electrolyte, wherein
said anode comprising a controlled release anode composition that comprises at least a
first anode active material and at least a first controlled release agent in physical contact
thereto for tentatively isolating said first anode active material from said electrolyte in the
beginning of a cell operation for a delayed oxidation of said first anode active material.
2. The electrochemical cell as set forth in claim 1, wherein said anode further comprises an
initial-stage anode active material in direct contact with said electrolyte.
3. The electrochemical cell as set forth in claim 1 or 2, wherein said cathode comprises an
oxygen electrode and said either first or initial-stage anode active material comprises a metal
element so that said cell constitutes a metal-air battery.
4. The electrochemical cell as set forth in claim 1 or 2, wherein said first anode active material
comprises a metallic element selected from the group consisting of lithium, magnesium,
aluminum, titanium, manganese, iron, chromium, nickel, and zinc.
5. The electrochemical cell as set forth in claim 1 or 2, wherein said controlled release agent
contains a material selected from the group consisting of a polymer, a ceramic, a glass, a carbon,
an organic, a metallic material, and combinations thereof.
6. The electrochemical cell as set forth in claim 1 or 2, wherein said first anode active material is
in a form of fine particles that are coated, plated, embedded or encapsulated with said controlled
release agent.
7. The electrochemical cell as set forth in claim 1 or 2, wherein said first anode active material is
in a fibrous, plate-like, disc-like, rod-like, or needle-like form which is coated, plated, embedded

1 or encapsulated with said controlled release agent in such a way that said first anode active material is separated from said electrolyte during an initial stage of a cell operation.

8. The electrochemical cell as set forth in claim 2, wherein said first anode active material differs in chemical composition from said initial-stage anode active material.

6 9. The electrochemical cell as set forth in claim 2, wherein said initial-stage anode active material comprises zinc and said first anode active material contains a metallic element selected from the group consisting of lithium, magnesium, aluminum, titanium, manganese, iron, chromium, nickel, and zinc.

11 10. The electrochemical cell as set forth in claim 1 or 2, wherein said first anode active material is coated or encapsulated with said first controlled release agent by a technique selected from the group consisting of electroplating, electrodeless coating, electrochemical deposition, physical vapor deposition, chemical vapor deposition, plasma deposition, organic phase separation, surface polymerization, solution coating, solvent casting, fluidized bed coating, thermal spraying, solution spraying, and combinations thereof.

16 11. The electrochemical cell as set forth in claim 1 or 2, wherein said first anode active material is coated or encapsulated with said first controlled release material comprising a metal having an electromotive force smaller than the electromotive force of said first anode active material but greater than the electromotive force of an oxygen half cell.

21 12. The electrochemical cell as set forth in claim 1 or 2, wherein said first anode active material is fully coated or encapsulated with said first controlled release agent, said agent comprising a metal with a small electromotive force selected from the group consisting of nickel, tin, lead, antimony, bismuth, and indium.

13. The electrochemical cell as set forth in claim 1 or 2, wherein controlled release is achieved through the mechanism selected from the group consisting of desorption, diffusion, erosion, wear

1 or destruction of a barrier material, degradation, chemical reaction, hydrolysis, thermodynamic
dissociation, and combinations thereof.

14. A multiple-cell battery assembly comprising a plurality of electrochemical cells, wherein at
least one of said cells is a cell as defined in claim 1 or 2.

6 15. The electrochemical cell as set forth in claim 1 or 2, wherein said electrolyte is substantially
free from a liquid during a cell storage period and said cell is actuated when a liquid is added to
said electrolyte.

16. The electrochemical cell as set forth in claim 15, wherein said liquid comprises water.